PHYS551
Biological Physics

Fall 2015
453 HBH

Instructor: Ching-Hwa Kiang
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Class meetings
The class will meet Tuesday and Thursday from 1:00pm to 2:15pm in 453 Herman Brown Hall.

Reference Texts

- Philip Nelson, *Biological Physics*, W. H. Freeman and Company (2004), ISBN 0716743728.
- M. Daune, *Molecular Biophysics: Structures and Dynamics*, Oxford University Press (1999).
- L. Stryer, *Biochemistry*, 5th ed., W. H. Freeman, New York (2003).
- Cantor and Schimmel, *Biophysical Chemistry, I, II, III*, W. H. Freeman, New York (1980).
- D. A. McQuarrie, *Statistical Mechanics*, Harper & Row, New York (1976).

Summary
This course will cover fundamentals of biological physics. The basic concepts will first be reviewed. The cells and their components will be visited briefly. Random walks and polymer physics models and their application to biological systems will be described. Entropy and energy concept and their roles in biological systems will be discussed. Molecular and cellular mechanics will be introduced. Experimental techniques such as single molecules techniques and their applications to biological molecules will be presented. Finally, the physics of cancer will be introduced.

Important Dates

25 August 2015	First day of class
12–13 October 2015	Midterm recess, no classes
26–27 November 2015	Thanksgiving recess, no classes
3 December 2015	Last day of class

Honor Code
The Rice Honor Code applies.

Homework Policy
Homework assignments will be given every week on Thursday. Homework will be due the following Thursday in the beginning of class. Late homework will not be accepted. You are allowed to collaborate with fellow students on your homework. You may not consult answer keys (from previous years, *etc.*). The homework you turn in must represent your own understanding.

Midterm Report
The midterm report is a short report on the topic and paper you chose to present at the end of the term. The selected topic/paper must be related to biological physics. Detailed instructions about the term paper will be given later in the semester.

Presentation
Each person will give a 45 minute presentation in class. The presentation should be based on a topic related to biological physics of your choice.

Credit

Homework	40 %
Midterm report	20 %
Presentation	40 %

Tentative Outline of the Course (Learning Objectives)
Fundamentals of DNA
Fundamentals of RNA
Protein Structures and Function
Cellular Structure and Function
Bacterial and Eukaryotic systems
Virus
Biomaterials
Single molecule techniques
Cancer and other diseases
Fluctuations and noise
Biological networks
Evolution

What you will be able to do (Learning Outcomes)
Describe the structure and function of nucleic acids and proteins
Describe the cellular and virus building blocks and functions
Calculate the mechanical properties of biomolecules
Describe single molecule techniques
Describe physics of cancer

If you have a documented disability that will impact your work in this class, please contact me to discuss your needs during the first two weeks of class. Additionally, you will need to register with the Disability Support Services Office in the Ley Student Center.